PERCEPTION OF MUSIC FOR ADULT COCHLEAR IMPLANT USERS: A QUESTIONNAIRE

Valerie Looi* & Jennifer She

Department of Communication Disorders, The University of Canterbury, Christchurch, New Zealand.

Introduction

Postlingually deafened adult cochlear implant (CI) users often find music to be less pleasant and less enjoyable post-implantation, and a music training program may help to enhance their appreciation of music. However existing studies do not provide detailed information from CI users on the factors which they feel contribute to their poorer ratings for music, nor do they investigate the approach a music training program should take. The purpose of this study was to develop and administer a questionnaire that collects unique information which would assist in the development of a training program aimed at improving CI users' music perception and appreciation.

This questionnaire differed from previous questionnaires, as CI users were asked to compare music to how they expect it to sound to a person with normal hearing. Unique rating scales were developed, and the focus of the questionnaire was on gathering detailed and specific information to assist in the future development of an effective music training program to improve implant users' appreciation of music.

Method – The Questionnaire

- Initially, unstructured, face-to-face interviews were conducted with adult CI users to determine their views on music perception and enjoyment with a CI.
- Based on the interviews, a pilot questionnaire was developed & administered to 9 adult CI users. The respondents were also interviewed to determine the clarity, appropriateness, length & validity of the questions and the questionnaire.
- The final version contained 48 questions, covering the following topics:
  - Music Listening & Musical Background;
  - Sound Quality Ratings of:

* Piano	* Drum Kit	* Guitar
* String Family	* Woodwind Family	* Brass Family
* Male Singer	* Female Singer	

  - Ratings for Musical Styles:

* Classical (orchestra)	* Classical (group of 2-5 instruments)	
* Classical (choir)	* Country & Western	
* Pop/Rock	* Jazz	* Other

  - Music Preferences;
  - Music Recognition;
  - Factors Affecting Music Listening Enjoyment;
  - Music Training Program.
- For instrumental sound ratings, subjects were asked to rate both the overall sound quality (Unpleasant-Pleasant; Unnatural-Natural), as well as specific qualities of the sound:

* Empty - Full	* Dull - Sharp	* Rough – Smooth
* Tinny - Rich	* More noisy – Less noisy	

- Asked to make their comparisons based on how they would EXPECT it to sound to a person with normal hearing (NH).
- Unique visual analog scales were developed using 100 subdivisions. In addition to the usual bipolar adjectives at the ends of each scale, some of these scales had a descriptor at the centre to reduce the ambiguity regarding what the centre of the scale meant.
  - E.g., for the Empty-Full scale:

- For musical styles ratings, the following scales were used:
  - * Unpleasant – Pleasant
  - * Simple – Complex
  - * Can never follow tune – Can always follow tune
  - * Can *never* identify this style by listening-alone – Can *always* identify this style by listening-alone
  - * Sounds *nothing* like I would expect it to sound to a person with NH – Sounds *exactly* as I would expect it to sound to a person with NH.
- General questions included:
  - How often they listened to music, and their overall enjoyment of music (pre-hearing loss, pre-CI, & now);
  - Musical training & involvement in musical activities (pre-CI & now);
  - If they used a HA in the contralateral ear, and if this had any impact on music listening.
- Questions about the music training program included:
  - How long each session should last for;
  - How many times a week;
  - Format preferred (e.g. DVD, CD, CD-Rom etc.);
  - Skills or topics they feel are important to include;
  - Any instruments, styles, songs etc. they would like to hear better.
- Approx. 1hr to complete (+/- ½ hr).
- Included both objective rating scales, closed-set choices, and open-ended qualitative questions.

Preliminary Results

- The questionnaire was posted to 221 adult Nucleus CI24 users, all using the ACE speech-processing strategy.
- 133 replies were received (60%). Of these:
  - 97 questionnaires were fully completed (44%).
  - 31 recipients either returned incomplete surveys, or replied to state that they were unable to complete the survey primarily due to poor health, or they did not listen to music.
  - 5 surveys were returned unopened.

So far, 50 questionnaires have been analysed:

- 29 CI-only users; 21 CI+HA users.
- Mean age: 61 yrs, 8 mths.
- Mean age diagnosed with a hearing loss: 26 yrs, 4 mths.
- Mean duration severe-profound deafness: 8 yrs, 4 mths.
- Mean length of time with CI: 4 yrs, 5 mths.

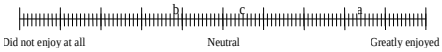
The following are the responses to a selection of questions, for these 50 surveys

- 33% had formal music training prior to getting their CI. No respondents have formal music training now, with their CI.
- 46% took part in musical activities prior to implantation, but only 12% participate in musical activities now, with their CI.

How often do you listen to music?

('a': 'Prior to having a hearing loss'; 'b': 'In the time just prior to getting your CI'; 'c': 'Now, with your CI')

How much do you enjoy listening to music?



('a': 'Prior to having a hearing loss'; 'b': 'In the time just prior to getting your CI'; 'c': 'Now, with your CI')

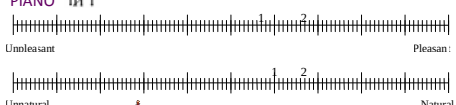
Do you notice a difference in the sound quality (for listening to music) between 'CI-only' and 'CI AND Hearing Aid'?

- Yes: 44%. No: 13% Never Tried: 42% (n=45)
- Of the 16 respondents who answered the follow-up question – 'If yes, which is better & why', 94% said CI+HA was better.

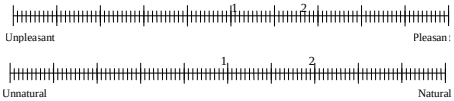
Sound quality ratings for different musical instruments or families:

(NB: '1' = CI only users (n=29); '2' = CI+HA users (n=21))

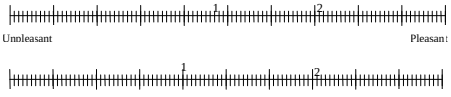
PIANO



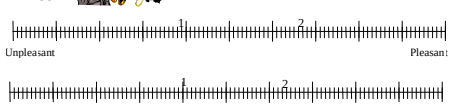
STRINGS



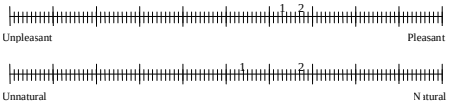
WOODWIND



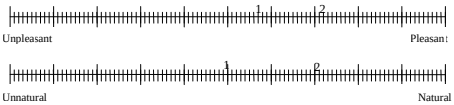
BRASS



MALE SINGER



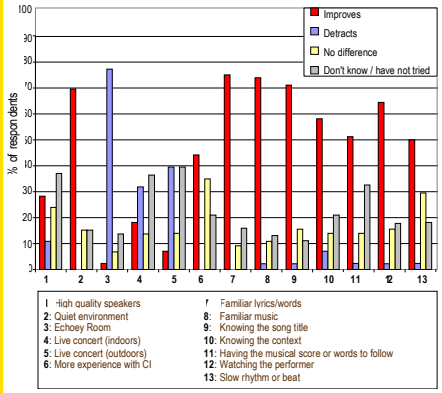
FEMALE SINGER



- For both the 'pleasant' and 'natural' scales, 2-way ANOVAs showed a significant difference between the ratings given by the CI-only and the CI+HA subjects ($p<0.001$), but no significant difference for the within-subjects factor of instruments, and no significant interaction. CI+HA users rated the sounds as both more pleasant, and more natural.

Preliminary Results Continued

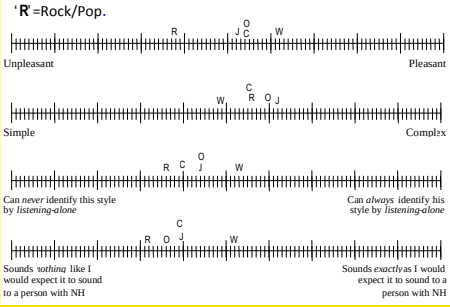
Factors that Impact on Music Listening Enjoyment with a CI



1: High quality speakers	7: Familiar lyrics/words
2: Quiet environment	8: Familiar music
3: Echoey Room	9: Knowing the song title
4: Live concert (indoors)	10: Knowing the context
5: Live concert (outdoors)	11: Having the musical score or words to follow
6: More experience with CI	12: Watching the performer
	13: Slow rhythm or beat

Musical Styles

'O'=Orchestra; 'C'=Choir; 'W'=Country & Western; 'J'=Jazz; 'R'=Rock/Pop.



Music Training Program Preferences

3 most-important skills to help music listening enjoyment:

1. Being able to recognise tunes known prior to implantation;
2. Being able to recognise commonly-known tunes;
3. Being able to hear or 'pick out' the tune when it's presented with harmony (accompaniment).

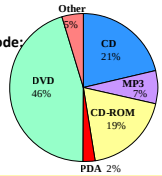
- 56% would be interested in a Music Training Program (n=45).
- 84% would find an accompanying written manual helpful.
- 69% would prefer the training program to introduce them to a wide range of musical styles (rather than just focusing on their preferred style).

Preferred format:

Length of session (mins):
Mean: 38.6; Mode: 30;
Range: 15-60.

Frequency (# times per week):
Mean: 2.7; Mode: 2;
Range: 1-7.

Delivery Mode:



Conclusions & Recommendations

- Users of a CI + HA rated instrumental sounds as significantly more pleasant, and more natural than those who used only a CI.
- Post implantation, respondents reported lower levels of (i) participation in musical activities & training, (ii) time spent listening to music, and (iii) enjoyment for music listening.
- Key factors that can enhance music listening enjoyment: high quality speakers; quiet environment; familiar lyrics, words and/or music; knowing the song title and/or context; having the musical score or words to follow; watching the performer; and music with a slow rhythm or beat.
- Key factors that are detrimental to music listening enjoyment: echoey rooms and live concerts.
- Country & Western music was rated to be the most pleasant, easiest to identify, and the style sounding most like they would expect it to sound to a person with NH.
- Rock music was rated to be the least pleasant, hardest to identify, and the style sounding least like they would expect it to sound to a person with NH.
- Many CI users would be interested in undertaking a music training program.
- Recognising familiar tunes is regarded as the skill that would best help them to improve their music appreciation.
- Preferred format for a music training program: 30 minute sessions, 2-3 times a week, on DVD, covering a range of styles, with an accompanying manual.

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